इसरो isro INDIAN SPACE RESEARCH ORGANISATION

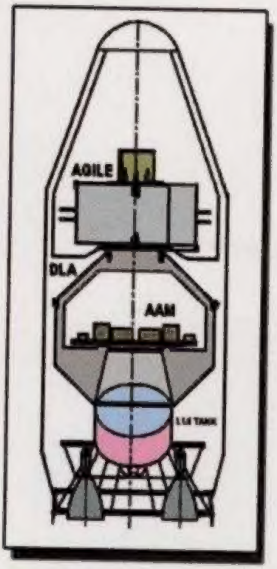
PSLV C8 - AGILE / AAM MISSION

PSLV-C8, the eight operational flight of Polar Satellite Launch Vehicle, is the first full commercial launch of ISRO. The launch is to inject AGILE, a 352 kg Italian Spacecraft developed for Italian Space Agency (ASI) into 550 km circular orbit with 2.5 ° inclination.

In addition to Agile, PSLV C8 will also carry an ISRO payload named Advanced Avionics Module (AAM) as co-passenger in Dual Launch Mode. Agile is mounted on top of the Dual Launch Adaptor (DLA), that sits over the tank of fourth stage of PSLV while AAM is inside the DLA.

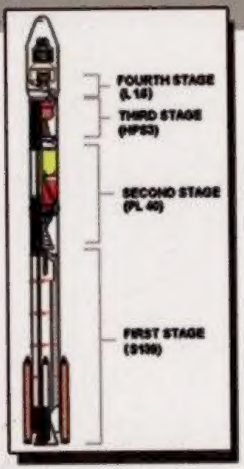
MISSION SPECIFICATION

Orbit	:	550 km circular
Inclination	:	2.5 °
Launch time	:	15:30 hrs IST (10:00 hrs GMT)
Launch station	:	Second Launch Pad
Launch Azimuth	:	99 °



PSLV-C8, is significant in the sense that this is the first mission that does not employ any of the solid strap-ons, that have been used in earlier flights. This configuration of the vehicle termed as PSLV-CA (Core Alone) has been chosen considering the lower payload capability required for Agile and capability of the vehicle as such. C8 is also the first flight in which PSLV is launching a satellite into a circular orbit of very low inclination (2.5 °).

VEHICLE

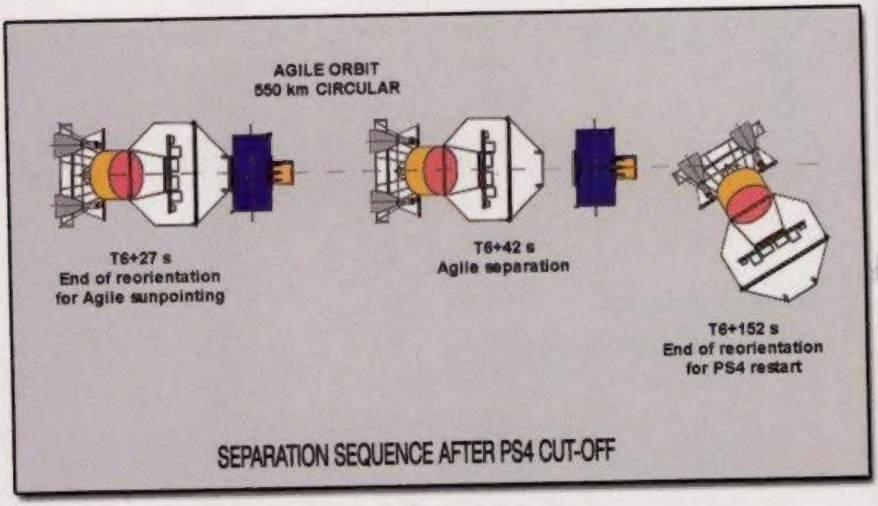


The Core-Alone vehicle configuration of PSLV (PSLV-CA) is employed for the C8 mission. The strap-on motors are not employed while the other propulsive elements and subsyetms essentially remain same as in PSLV C7 except for the changes mentioned under the section Major changes.

Overall height	:	44.4 m
Lift-off mass	:	228.27 t
First stage	:	PS1 (S139) HTPB Solid propellant
Second stage	:	PS2 (PL40), UH25 + N_2O_4 Liquid propellant
Third stage	:	HPS3, HTPB Solid propellant
Fourth stage	:	PS4 (PL1.6), MMH + MON Liquid propellant

MAJOR CHANGES

- Core-Alone vehicle
- On-board guidance and control software design modified to meet low inclination requirements
- Use of Aerodynamic Stabiliser (AST) hardware in P+ P- axis for stability
- Flight testing of Advanced Mission Computers and Advanced Inertial Navigation Systems / Advanced Telemetry System in piggyback mode
- New checkout system for AAM
- Induction of AA6061 water tank instead of AA7020 in PS2 stage
- Use of 1.6 t propellant tank for PS4 stage
- Anchoring scheme during movement of vehicle from Vehicle Assembly Building to Launch Pad



SEPARATION SEQUENCE AFTER PS4 CUT-OFF

EVENT	TIME (s)	ALTITUDE (km)	VELOCITY (km/s)
Ignition of PS1	0.0	0.025	0.452
Separation of PS1	112.9	50.07	1.737
Ignition of PS2	113.2	50.25	1.736
Heat Shield Separation	202.9	115.9	2.950
Separation of PS2	263.7	147.2	4.743
Ignition of PS3	264.9	147.8	4.742
Separation of PS3	517.8	282.8	7.581
Ignition of PS4	1033.0	507.7	7.317
Cut-off of PS4	1331.8	550.0	7.583
Agile Separation	1373.8	549.9	7.585

ITALY 352 kg

AGILE (Astro-rivelatore Gamma Immagini Leggero) is a scientific mission dedicated to high-energy astrophysics operated by the Italian Space Agency (ASI) and scientifically developed in CNR and INFN laboratories of Italy.

The mission is to detect simultaneously gamma rays and hard X-rays using detectors viz. Super-AGILE (SA) and Gamma-Ray Imaging Detector (GRID) made of a Silicon Tracker and a Mini-Calorimeter. The Mini-Calorimeter is also capable of independently detect transient events. It can detect and image photons in the 30 MeV - 50 GeV and 10 keV - 40 keV energy bands. Agile will be orbiting in the near equatorial (2.5deg) orbit to take advantage of higher celestial activities in this field.

The satellite payload consists of detector having mainly Silicon tracker gamma-ray detector (ST), Mini-calorimeter detector (MCAL) & X-ray detector named Super-AGILE (SA) and Anti-Coincidence subsystem (AC). On detection of gamma ray burst, the information will be communicated to Orbcom constellation and message will be sent to scientists on the location of celestial activities for their further observation and studies using ground based instruments.

Agile having an overall size of satellite is 1689 x 2778 mm, will be powered by Li-Ion battery having 33 AH capacity. The battery will be charged using the fixed solar panel of 2100 x 1050 mm size. The nominal attitude of Agile is sun-pointing and for attitude pointing and control, star sensor, magnetometer and reaction wheels are used.

The ground station to be used is Malindi in Kenya and the communication is using S-band (2283.5 MHz down link and 2093.9 MHz uplink). Satellite is provided with two numbers of separation switches and bus will be ON immediately after separation from launch vehicle. The RF carriers will be ON just prior to contact with ground station. Interface with PSLV is through a Satellite Interface Ring weighing 3.8 kg having bolted connection with PSLV and this will be part of satellite on separation. The separation is by means of band clamp release and the required separation velocity of 1.2 m/s is provided by 4 numbers of springs.

ADVANCED AVIONICS MODULE

INDIA 185 kg

The AAM is a module consisting of the next generation avionic packages viz, Advanced Mission Computers (AMC) based NGC system, Advanced Inertial Navigation & Telemetry systems (AINS & ATS) that will become the prime avionic systems in the future.

The availability of excess payload capability in PSLV C8 has mooted the idea of flight qualifying these packages before inducting them into the main stream. The performance of these packages will be compared with the existing flight packages. This will help assess the package performance and incorporate suitable improvements before actually inducting these systems as the prime avionic systems in the future missions.

AAM UNDERGOING CHECKS

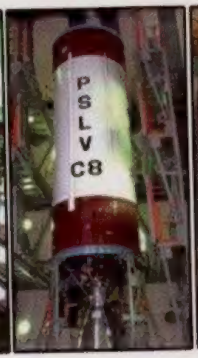
Though AAM is similar to a satellite flying in PSLV, it will not be separated from the spent stage. PSLV payload capability will improve by around 25 kg, once these packages are inducted into the operational phase.

The major highlight of AAM is the use of a ASIC based Computer with a 16 bit CPU called Vikram 1601, designed by VSSC, with operating frequency of 30 MHz. The AAM includes an improved version of the existing guidance package and advanced inertial system with state of the art gyros.

C8 LAUNCH CAMPAIGN ACTIVITIES

CBS + NES AT SLP

FIRST STAGE



SECOND STAGE

THIRD STAGE

FOURTH STAGE

AAM MOUNTED ON PLA

AGILE MOUNTED ON DLA

OPERATIONAL FLIGHTS

PSLV-C1	29 September 1997	IRS-1D
PSLV-C2	26 May 1999	IRS-P4, KITSAT, TUBSAT
PSLV-C3	22 October 2001	TES, PROBA, BIRD
PSLV-C4	12 September 2002	KALPANA-1
PSLV-C5	17 October 2003	IRS-P6
PSLV-C6	5 May 2005	IRS-P5, HAMSAT
PSLV-C7	10 January 2007	CARTOSAT-2, SRE LAPAN TUBSAT, NANO PEHUENSAT

PUBLISHED BY : DOCUMENTATION SECTION, PSLV PROJECT, VSSC, VALIAMALA, TRIVANDRUM

PRINTED AT : ST. JOSEPH's PRESS, TRIVANDRUM

design : ss vinod / pslv project